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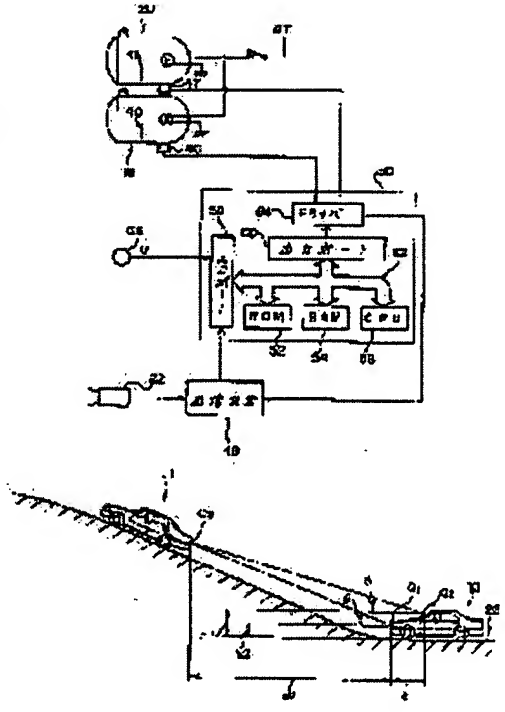
(71)Applicant : TOYOTA MOTOR CORP

(72)Inventor : TAKAGI MAKOTO
SATONAKA HISASHI
NAKAMURA TAKASHI

(54) LIGHT DISTRIBUTION CONTROL DEVICE FOR HEAD LAMP

(57)Abstract:

PURPOSE: To irradiate optimum positions without putting the other vehicle in the glare of light by controlling the direction and range of irradiation so as not to irradiate the mirror of a preceding vehicle and the eye point of the driver of an opposed vehicle on the basis of the distance between head lamps and an image detecting means, the detected direction and the inter-vehicle distance.



CONSTITUTION: A control angle θ is obtained from a direction angle ϕ and inter-vehicle distance ΔV obtained by an processing device 48 from the positions Q1 of the head lamps 18, 20 of an own vehicle 10, the position Q2 of a camera 22 and the boundary position (cut line position) Q3 of the light and dark parts of light distribution for preventing glare to a preceding vehicle 11, and an optical axis is moved vertically according to the control angle θ. The moving quantity of actuators 46, 47 corresponding to this angle is computed. In this case, the moving quantity is made smaller than the maximum moving quantity to become the control angle θ. For instance, an irradiation range is to be below the predetermined positions of a rear view mirror and a fender mirror from the positions of tail lamps in the preceding vehicle, and below the eye point position of

an occupant from the positions of the head lamps 18, 20 in the opposed vehicle.

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CLAIMS

[Claim(s)]
[Claim 1] The luminous-intensity-distribution control unit of a head lamp characterized by providing the following A picture detection means for it to be arranged in a different position from the head lamp which can change either [at least] the direction of radiation or the irradiation range, and to detect the picture ahead of self-vehicles An operation means to find the distance between two cars of the other car and self-vehicles while asking for the detection direction of the other car on the basis of the aforementioned picture detection means based on the detected picture, It is based on the distance of the aforementioned head lamp and the aforementioned picture detection means, the aforementioned detection direction, and the distance between two cars. When the aforementioned other car is precedence vehicles, while making it light not irradiated by the mirror for a back check of precedence vehicles, when the aforementioned other car is opposite vehicles, in order to make it light not irradiated by the eye point of the driver of opposite vehicles, Control means which ask for the control direction on the basis of the aforementioned head lamp, and control either [at least] the direction of radiation of the aforementioned head lamp, or the irradiation range based on this control direction

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] this invention starts the luminous-intensity-distribution control unit of a head lamp, and relates to the luminous-intensity-distribution control unit of the head lamp which controls in detail the luminous intensity distribution of the head lamp which irradiates the front of vehicles.
[0002]
[Description of the Prior Art] The head lamp is arranged by vehicles in order to raise the visibility ahead of a driver at night etc. Although the large area is irradiated comparatively, a driver cannot irradiate a part required to view brightly during the run when this head lamp being fixed at the nose of cam of abbreviation of vehicles, and being set beforehand at which vehicles circle. For this reason, the front lighting system for vehicles which forms a shutter in the irradiation side of the front lighting system for vehicles and head lamp which change the irradiation optical axis and irradiation range of a head lamp according to a steering angle etc., and changes the irradiation range by opening and closing of a shutter is proposed (JP,55-22299,B, JP,2-27938,U, JP,1-293247,B).
[0003] By the way, ahead [self-vehicles], the other cars, such as precedence vehicles, usually exist. When the other car exists ahead [this / self-vehicles] and luminous intensity distribution are controlled only from the direction of self-vehicles, such as a steering angle, the driver of the other car may sense dazzling. In order to cancel this, the self-vehicles front is photoed and the front lighting system for vehicles which is extracted and is switched to a low beam from a high beam in quest of the distance between interval empty vehicles of the extracted tail lamp is proposed by carrying out the image processing of the tail lamp of the other car from a photography picture (JP,62-131837,A).
[0004]
[Problem(s) to be Solved by the Invention] However, vehicles run ways, such as a passage, are not restricted to continuation of a flat surface with a fixed road surface configuration, and may have the inclination of a slope, a mountains passage, etc. Therefore, the position of the other car on a photography picture becomes various. For example, it may be located in the same part on the photography picture which the other car which runs the vehicles front by the difference of elevation of a passage photoed with the camera. For this reason, the position of the other car is accidentally pinpointed from the picture ahead of vehicles, and it may be controlled by luminous intensity distribution which give dazzle to the other car.
[0005] this invention aims at offer of the luminous-intensity-distribution control unit of the head lamp which can irradiate the optimal position which does not give dazzle to the other car and a driver views in consideration of the above-mentioned fact.
[0006]
[Means for Solving the Problem] A picture detection means for this invention to be arranged in a different position from the head lamp which can change either [at least] the direction of radiation or the irradiation range in order to attain the above-mentioned purpose, and to detect the picture ahead of self-vehicles, An operation means to find the distance between two cars of the other car and self-vehicles

while asking for the detection direction of the other car on the basis of the aforementioned picture detection means based on the detected picture, It is based on the distance of the aforementioned head lamp and the aforementioned picture detection means, the aforementioned detection direction, and the distance between two cars. When the aforementioned other car is precedence vehicles, while making it light not irradiated by the mirror for a back check of precedence vehicles, when the aforementioned other car is opposite vehicles, in order to make it light not irradiated by the eye point of the driver of opposite vehicles, It asked for the control direction on the basis of the aforementioned head lamp, and has the control means which control either [at least] the direction of radiation of the aforementioned head lamp, or the irradiation range based on this control direction.

[0007]

[Function] The luminous-intensity-distribution control unit of the head lamp of this invention is equipped with the picture detection means arranged in a different position from the head lamp which can change either [at least] the direction of radiation or the irradiation range. A picture detection means detects the picture ahead of self-vehicles. There are image pck-up equipments, such as a TV camera and an infrared camera, in this picture detection means. Moreover, the direction of radiation of a head lamp can be defined by the optical axis of a head lamp, and the irradiation range can be defined with the configuration and position of a member which shade the angle of divergence of the light injected from a head lamp, and light. With an operation means, while asking for the detection direction of the other car on the basis of a picture detection means based on the detected picture, the distance between two cars of the other car and self-vehicles is found. There are precedence vehicles and opposite vehicles in this other car. When precedence vehicles and opposite vehicles run the front at the time of a self-vehicles run, a bird clapper has identically the position of the other car in the picture detected by the road grade ahead of self-vehicles etc. Thereby, when the positions of a picture detection means and a head lamp differ, and it asks for the direction which controls a head lamp from the detected picture, a bird clapper tends to differ from the direction of desired. It can ask for the direction of this request by pinpointing the position of the other car, and can ask for the position of the other car from the distance of a head lamp and a picture detection means, the detection direction, and the distance between two cars. Then, based on the distance of a head lamp and a picture detection means, the detection direction, and the distance between two cars, while making it light not irradiated by the mirror for a back check of precedence vehicles, it asks for the control direction on the basis of the head lamp for making it light not irradiated by the eye point of the driver of opposite vehicles, and either [at least] the direction of radiation of a head lamp or the irradiation range is controlled by control means based on the control direction for which it asked. Thus, since it controls so that the position or direction where the other car senses dazzle for the direction of radiation and the irradiation range of a head lamp are not included, even if the other car exists in the run way which has inclination etc., according to this inclination etc., the light by the optimal direction of radiation or the irradiation range is irradiated by run ways, such as a passage.

[0008]

[Example] Hereafter, with reference to a drawing, the example of this invention is explained in detail. this example photos the front of vehicles 10 with a camera, and when controlling the luminous intensity distribution of a head lamp based on this gradation picture, it applies this invention.

[0009] As shown in drawing 1 , the engine hood 12 is arranged at the upper surface section of front body 10A of vehicles 10, and the head lamps 18 and 20 of a right-and-left couple (cross direction both ends) are arranged in the upper part of the front bumper 16 fixed to the cross direction both ends of the front end section of front body 10A. Moreover, windshield glass 14 is formed near the back end section of the engine hood 12. It is the upper part of this windshield glass 14, and the room mirror 15 is formed in the vehicles 10 interior, and the camera 22 for photoing the vehicles front night near the visual position (the so-called eye point) of a this about 15 room mirror driver is arranged. This camera 22 is connected to the image processing system 48 (drawing 5). The camera for night vision with the image-intensifier pipe which carries out multiplication of the intensity of the dark visible image which received the X-ray, the corpuscular ray, etc., and is changed into a bright visible image may be used for this camera 22. In addition, the speedometer which is not illustrated is arranged in vehicles 10 and the vehicle speed sensor

66 (drawing 5) which detects the vehicle speed V of vehicles 10 is attached in the cable which this speedometer that is not illustrated does not illustrate.
[0010] As shown in drawing 2 , a head lamp 18 is a projector type head lamp, and has the lamp house 34. A convex lens 30 is fixed to one opening of this lamp house 34, and the bulb 32 is being fixed to opening of another side through the socket 36 so that the point emitting light may be located on the optical axis L of a convex lens 30 (medial axis of a convex lens 30).
[0011] The bulb side of the lamp house 34 interior is used as the reflector 38 of an ellipse reflector, and the reflected light of the bulb 38 by this reflector 38 is condensed between a convex lens 30 and a bulb 32. It is fixed so that the upper limit of the shade 40 (refer to drawing 3) may be located near [this] a condensing point. The configuration of this shade 40 is beforehand set to the ****** sake of a check-by-looking disposition top, such as a pedestrian of a driver, and an indicator, or an oncoming car, and the light of the bulb 32 in which reflective condensing was carried out by the reflector 38 is divided by passage light and the shaded light, and is injected by the shade 40 from a convex lens 30.
[0012] Moreover, bearing 42 is being fixed to up front part 34A of a lamp house 34. This bearing 42 is supported to revolve by the support 44 fixed at a level with the frame which vehicles 10 do not illustrate. Moreover, the nose of cam of the shape of a cylinder of needle 46A of an actuator 46 is attached in lower back part 34B of a lamp house 34. It is fixed to the frame which vehicles 10 do not illustrate, and this actuator 46 consists of worm gearing which uses motor 46D and needle 46A as a worm. That is, the back end of needle 46A is engraved so that it may function as a worm, and it is clenched by worm wheel 46B. Movement of this needle 46A is linearly enabled by the sliding mechanism which is not illustrated, the axis of rotation of worm wheel 46B is fixed to shaft 46C of motor 46D, and rotation of motor 46D is changed into the straight-line drive of needle 46A. Therefore, needle 46A expands and contracts perpendicularly (the direction of drawing 2 arrow A) by rotation of motor 46D according to the signal from a control unit 50. If needle 46A contracts, the RLC of the head lamp 18 will be carried out, an optical axis L turns into an optical axis LU, if needle 46A develops, the RRC of the head lamp 18 will be carried out, and an optical axis L will turn into an optical axis LD. Thus, according to expansion and contraction of needle 46A, a head lamp 18 rotates a support 44 as a shaft, and an optical axis L is deflected in the vertical direction (UP or the DN direction of drawing 1).
[0013] The head lamp 20 is equipped with the shade 41 and the actuator 47 (drawing 5). Since the composition of a head lamp 20 is the same as that of a head lamp 18, detailed explanation is omitted.
[0014] The cutline which is the boundary of light and darkness with the above-mentioned shade is located in a road, and by rotation of a head lamp, as shown in drawing 4 , a cutline is displaced to parallel from the position (position of the cutline of drawing 4) corresponding to the least significant of the upper part of the shade to the position (position of the fictitious outline of drawing 4) corresponding to the most significant. In addition, you may control the above-mentioned shade to achieve right-and-left independence and to move from the center of drawing.
[0015] As shown in drawing 5 , the control unit 50 is constituted including the buses 62 which connect a read-only memory (ROM) 52, RAM (RAM) 54, a central processing unit (CPU) 56, input port 58, an output port 60, and these, such as a data bus and a control bus. In addition, the control program mentioned later is memorized by this ROM52.
[0016] The vehicle speed sensor 66 and the image processing system 48 are connected to input port 58. The output port 60 is connected to the image processing system 48 while connecting with actuators 46 and 47 through a driver 64.
[0017] In addition, the road configuration corresponding to one lane formed with a configuration (white line), for example, the center line, a curbstone, etc. of an advance way is included in the above-mentioned road configuration.
[0018] Next, recognition processing of the other car in the image processing of this example and data processing of the distance between two cars are explained. In addition, each pixel on the image formed of a picture signal pinpoints a position with the coordinate (Xn and Yn) of the system of coordinates which become settled by the X-axis which was set up on the image, and which intersects perpendicularly respectively, and the Y-axis.

[0019] As shown in drawing 6 (1), the precedence vehicles 11 are located in the white line 124 of the lane both sides of the road 122 vehicles 10 run with the image 120 which is the picture photoed with the camera 22. In an image processing system 48, the image processing of this image 120 is carried out.
[0020] First, after performing white line candidate point sampling processing and straight-line approximation processing in order as follows and detecting the run lane of vehicles 10, it is the vehicles recognition field WP. It sets up.
[0021] In white line candidate point sampling processing, the candidate point presumed to be the white line of a lane is extracted. First, window field WS which has the predetermined width of face gamma presumed that a white line is included It sets up (refer to drawing 6 (3)), and is this window field WS. Change of an inner luminosity extracts a large point (the maximum point of the differential value of a vertical luminosity) as a white line candidate point (edge point). The case where it asked for continuation of this edge point was shown in the dotted line 132 of drawing 6 (3). In addition, since the accuracy in which the precedence vehicles 11 exist is low, the range between the upper limit line 128 beforehand defined as a processing-object field and the minimum line 130 is used for the field of the upper and lower sides of an image 120.
[0022] It asks for the straight lines 134 and 136 which met the line which carries out straight-line approximation of the edge point extracted by white line candidate point sampling processing using the Hough (Hough) conversion, and is presumed to be a white line in the next straight-line approximation processing. It is the vehicles recognition field WP about the field surrounded by these straight lines 136 and 138 and the minimum line 130. It sets up by carrying out (refer to drawing 6 (4)). In addition, vehicles recognition field WP with the inclination difference of the straight lines 136 and 138 for which it asked the account of a top when the above-mentioned road 122 was a curve way It becomes (refer to drawing 6 (2)).
[0023] Vehicles recognition field WP Inside WP of the vehicles recognition field set up by carrying out detection processing as follows after a setup was completed While judging the existence of the precedence vehicles 11 which can be set, distance-between-two-cars deltaV is calculated at the time of ** of the precedence vehicles 11.
[0024] First, vehicles recognition field WP Peak point EP of a position that detect an edge point like the above-mentioned white line candidate check appearance processing inside, and the integration value which integrated with the detected edge point in the longitudinal direction exceeds a predetermined value It detects (refer to drawing 6 (5)). In addition, peak point EP When there are more than one, the peak point EP (nearer point of distance) of being located below on a picture is chosen. This peak point EP The window field WR which includes the ends of a horizontal corresponding pixel respectively, and WL It sets up (refer to drawing 6 (6)). This window field WR and WL When a vertical continuing point (vertical lines 138R and 138L) is stabilized inside and detected inside, it judges with the precedence vehicles 11 existing.
[0025] Since it corresponds to breadth of a car, the interval of the longitudinal direction of these detected vertical lines 138R and 138L is this breadth of a car and the peak point EP. Distance-between-two-cars deltaV of the precedence vehicles 11 and the self-vehicles 10 is calculated from a position. The interval of the longitudinal direction of vertical lines 138R and 138L can be calculated from the difference of each typical X coordinate (for example, an average coordinate value and the coordinate value of many frequency) of vertical lines 138R and 138L.
[0026] Next, recognition processing of oncoming car both 11A from an image 120 is explained. First, after the above-mentioned precedence vehicles recognition processing, the amount alpha of amendments of an amendment sake is set up so that the approximation straight line 132 (oncoming car both sides) for which it asked may be included. Since the accuracy to which opposite vehicles are located in about 132 approximation straight line of oncoming car both sides is high, this amendment is for an amendment about this. The method of the right of the straight line 133 for which it asked in quest of the straight line 133 according to this set-up amount alpha of amendments (at the time of left-hand traffic) is set up as oncoming car both recognition field WPO (refer to drawing 7). In oncoming car both this recognition field WPO, like the above-mentioned precedence vehicles recognition processing, recognition

processing of the oncoming car both 11A is carried out, and it asks for distance-between-two-cars deltaV.
[0027] In addition, although a white line 124 is detected above and the road is pinpointed, the curbstone formed in the side edge section of a road 122 may detect, without using only a white line 124. In this case, each can detect a white line and a curbstone by changing the disregard level of a gradation picture.
[0028] Next, the processing which asks for the direction of the other car by the road grade etc. with an image processing system 48 from the image of the photoed picture is explained. The image 120 used as the criteria which carry out abbreviation coincidence with the picture which the driver when photoing the flat road 122 vehicles 10 run with a camera 22 views was shown in drawing 8 . By this road 122, the center line 123 is made into the boundary of each lane, and let the white lines 124 be boundaries a road 122 and other than it.
[0029] The reference point D (XD and YD) of the position corresponding to a look (direction parallel to a flat road) when a driver views the front to the run direction of vehicles 10 and parallel is beforehand set to the image 120. Let the lines which make this reference point D (XD and YD) the reference point of the image 120 photoed by the camera 22, and pass through a reference point D respectively, and intersect perpendicularly respectively be a horizontal line Hor and a vertical line Ver. This horizontal line Hor is in agreement with the horizon of the image 120 photoed when vehicles 10 ran the flat ground.
[0030] As shown in drawing 9 , the image 121 photoed with the camera 22 in case the passage 122 ahead of the vehicles 10 which are running the flat ground is the downward slope which has the inclination of an angle theta from the flat ground becomes the compression picture which went in the direction of downhill, and the horizon of an image 121 moves it to a lower part from the position of the horizon when photoing the flat passage 122. Therefore, horizontal line Hm which passes the pixel of the center line 123 of this image 121, and the topmost part grade of tracing of the pixel on the image of a white line 124 Deflection deltaH with the horizontal line Hor which passes through a reference point corresponds to the above-mentioned inclination. Therefore, horizontal line Hm corresponding to the horizon of the image photoed as mentioned above If it asks for deflection deltaH and an optical axis L is made to go up and down according to the size of this deflection deltaH after asking for a position, a driver can irradiate sufficient field to view by the head lamp.
[0031] It can ask for the direction of the other car on the basis of a camera (the vectorial angle phi from a horizontal line) using such an inclination deriving method. That is, since the position of the perpendicular direction on the image of the tail lamp which carried out [above-mentioned] detection corresponds in the direction of the other car, it is the above-mentioned horizontal line Hm. If a position is replaced with the position of a tail lamp (it is a head lamp at the time of precedence vehicles and opposite vehicles) and it asks for deflection deltaH, it can ask for the direction of the other car.
[0032] Here, with inclination of the passage ahead of vehicles etc., even if the distance between two cars differs and the time of the position of the other car on an image becoming the same and the distance between two cars are the same, the position of the other car on an image may change. As shown in drawing 10 , even if distance-between-two-cars deltaV from the self-vehicles 10 to the precedence vehicles 11 differs, the position on an image has a bird clapper as it is the same. In this case, both the angles for which it asked as a phase control angle for carrying out luminous-intensity-distribution control from an image are angles phi. On the other hand, since the height to the passage of a head lamp and a camera differs, the phase control angle theta which deflects the optical axis of a head lamp becomes a different angle. That is, a phase control angle is set to angle thetaa in precedence vehicles 11a near the self-vehicles 10, and a phase control angle is set to angle thetab in precedence vehicles 11b far from the self-vehicles 10.
[0033] Then, as this example showed to drawing 11 , it is a point Q2 about the arrangement position of a point Q1 and a camera in the head-lamp position of the self-vehicles 10. It is a point Q3 about the position (they are the boundary position of the light-and-darkness section of anti-dazzle **** luminous intensity distribution, and a cutline position to the precedence vehicles 11) which was carried out and near the tail lamp of the precedence vehicles 11 defined beforehand. If it carries out, it can ask for the

phase control angle theta on the basis of a head lamp
[0034]
[Equation 1]

$$\theta = \tan^{-1} \frac{h1 - h2 + (\Delta V + d) \cdot \tan\phi}{\Delta V} \quad --- (1)$$

[0035] however, an h1:passage to point Q1 up to -- height h2: -- a passage to point Q2 up to -- height d : Point Q1 Point Q2 Horizontal distance phi : the vectorial angle of the other car on the basis of a camera -- therefore Ask for the vectorial angle phi with the distance between two cars and a camera using the photoed image, and if it asks for the phase control angle theta by the head lamp from the found distance between two cars and a vectorial angle phi and an optical axis L is made to go up and down according to the size of this phase control angle theta a driver -- sufficient field to view -- and the other car -- anti-dazzle **** -- luminous intensity distribution [like] can be irradiated by the head lamp
[0036] Hereafter, an operation of this example is explained. First, if a driver turns on the light switch which vehicles do not illustrate and head lamps 18 and 20 are made to turn on, the luminous-intensity-distribution control main routine shown in drawing 12 for every predetermined time will be performed, and it will progress to Step 202. At Step 202, while outputting the image reading signal which is an indication signal which starts an image processing to an image processing system 48, data called for in the image processing system 48, such as existence of the other car, are read. In an image processing system 48, if an image reading signal is inputted, the image processing of the image of a photography picture will be carried out, and the existence, the distance between two cars, and the vectorial angle phi of the other car will be called for so that it may mention later.
[0037] At the following step 204, it judges whether the other car has been recognized in an image processing system 48, and when the other car is on an image, it progresses to Step (affirmative judgment) 206. At Step 206, from the distance between two cars found with the image processing system 48, and a vectorial angle phi, it asks for the phase control angle theta on the basis of a head lamp based on the above-mentioned formula (1), and the movement magnitude of the actuators 46 and 47 corresponding to the angle which the optical axis L which is an actual controlled variable accomplishes is calculated. In this case, if the maximum movement magnitude of the actuators 46 and 47 used as a phase control angle theta is calculated and it is made movement magnitude smaller than this maximum movement magnitude, even if it is which movement magnitude, it will become anti-dazzle ****** movement magnitude to the other car. For example, what is necessary is just a lower part from the position of crew's eye point beforehand defined from the position of a head lamp by opposite vehicles that what is necessary is just a lower part from the position of the door mirror beforehand defined from the position of a tail lamp by precedence vehicles, or a side-view mirror.
[0038] At the following step 208, actuators 46 and 47 are moved according to the calculated movement magnitude, the optical axis of head lamps 18 and 20 is deflected, and this routine is ended.
[0039] On the other hand, when the other car did not exist and negative judgment is carried out in Step 204, it progresses to Step 210. When the other car does not exist, since the vehicles front is a passage, a driver makes the angle beforehand set that sufficient field to view is irradiated a phase control angle theta supposing the case where it runs a flat passage, and it calculates a controlled variable. Moreover, when inclination is in a passage, a controlled variable is calculated on the basis of a flat passage by making the vectorial angle phi according to the inclination of a passage into a phase control angle theta.
[0040] Next, the image processing in the image processing system 48 of this example is explained with reference to drawing 13 . An image processing system 48 will read the image 120 (refer to drawing 5 (1)) of the picture ahead of the vehicles 10 photoed with the camera 22, if an image reading signal is inputted from a control unit 50 (Step 302). Recognition processing of the precedence vehicles explained above using this read image 120 and opposite vehicles is performed (Step 304). At the following step 306, it judges whether the other car exists on an image, and when the other car is on an image, it

progresses to Step (affirmative judgment) 308. At Step 308, it asks for distance-between-two-cars deltaV by the image processing which asks for the horizontal interval of the extracted edge point of having explained above. On the other hand, since it is not necessary to ask for negative judgment) and distance-between-two-cars deltaV at the (step 306 when the other car does not exist, it progresses to Step 310.

[0041] At Step 310, it asks for the vectorial angle phi by the inclination of a road by asking for the variation rate of the horizontal line changed on an image as explained above. At this step 310, when the other car exists, it asks for a vectorial angle phi by making into level line position the position (for example, the position beforehand defined from the position of a tail lamp by precedence vehicles, the position beforehand defined from the position of a head lamp by opposite vehicles) of the anti-dazzle **** sake beforehand defined to the other car.

[0042] The data which express with the following step 312 the existence of the other car for which it asked above, distance-between-two-cars deltaV, and a vectorial angle phi are outputted, and an image processing is ended.

[0043] thus -- since it asks for the phase control angle theta by the position of the head lamp actually controlled by this example from the vectorial angle phi with the distance between two cars and the camera for which it asked using the photoed image and is made to carry out luminous-intensity-distribution control according to the size of this phase control angle theta -- a driver -- sufficient luminous intensity distribution to view -- and the other car -- anti-dazzle **** -- luminous intensity distribution [like] can be irradiated by the head lamp

[0044] In addition, although it was made to carry out luminous-intensity-distribution control in the above-mentioned example, application to the equipment which is made to move shading meanses, such as the shade arranged in the light source's injection side, and carries out luminous-intensity-distribution control is also possible for this invention, without being limited to this.

[0045] Moreover, although the above-mentioned example explained the case where the distance between picture empty vehicles photoed with the camera was found, you may make it measure the distance of the other car and self-vehicles for a distance-between-two-cars measuring device separately in preparation for vehicles.

[0046]

[Effect of the Invention] according to [as explained above] this invention -- the distance of a head lamp and a picture detection means, the detection direction, and the distance between two cars -- being based -- the direction of radiation of a head lamp, and the irradiation range -- even if few, in order to change one side, even if it is the case where the controlled variable of the angle of the optical axis at the time of luminous intensity distribution, the position of a shading means, etc. changes with the inclination of a road etc., it is effective in the ability to be able to irradiate the optimal

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the perspective diagram seen from the vehicles slanting front which shows the vehicles anterior part of this example.
[Drawing 2] It is the outline block diagram showing the head lamp which can apply this invention.
[Drawing 3] It is the diagram (view view of drawing 2) showing the composition of the shade.
[Drawing 4] It is an image view for explaining the cutline displaced by expansion and contraction of an actuator.
[Drawing 5] It is the block diagram showing the outline composition of a control unit.
[Drawing 6] It is an image view for explaining process in which precedence vehicles are recognized based on the picture which a camera outputs.
[Drawing 7] It is the image view showing oncoming car both the recognition field.
[Drawing 8] It is the image view of the picture signal which a camera outputs.
[Drawing 9] It is the image view of the photography picture of the passage which has inclination.
[Drawing 10] It is the image view showing the state where self-vehicles and precedence vehicles run the passage which has inclination.
[Drawing 11] It is an image view for explaining the phase control angle in the passage which has inclination.
[Drawing 12] It is the flow chart which shows the luminous-intensity-distribution control main routine of this example.
[Drawing 13] It is the flow chart which shows the manipulation routine of the image processing system of this example.
[Description of Notations]
18 Head Lamp
22 Camera
48 Image Processing System

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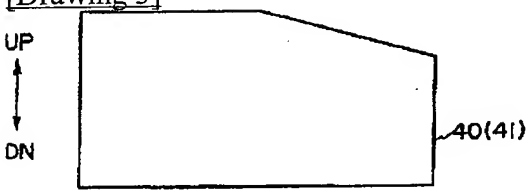
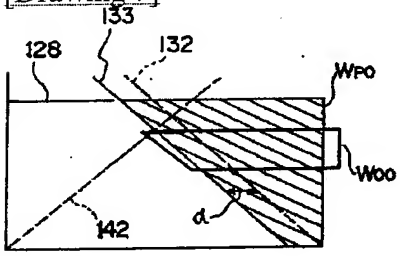
DRAWINGS

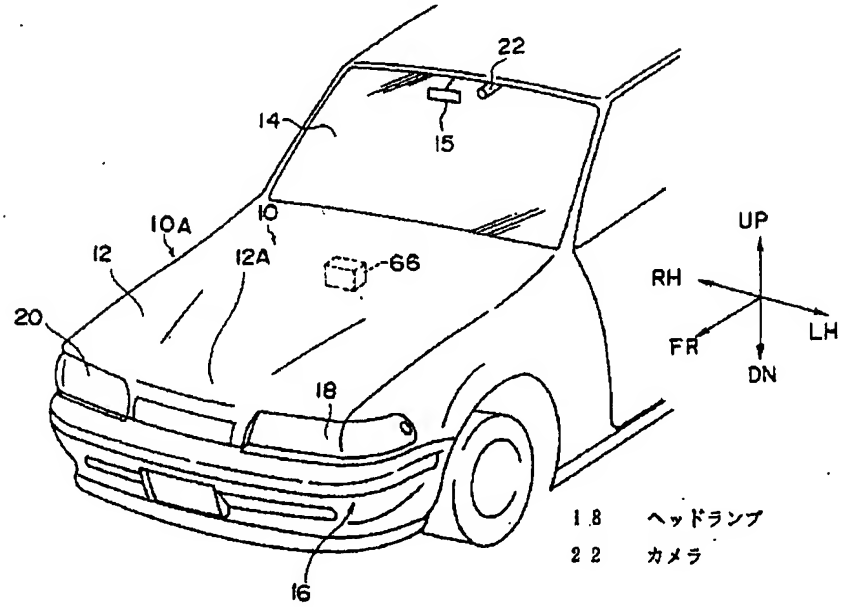
[Drawing 3]



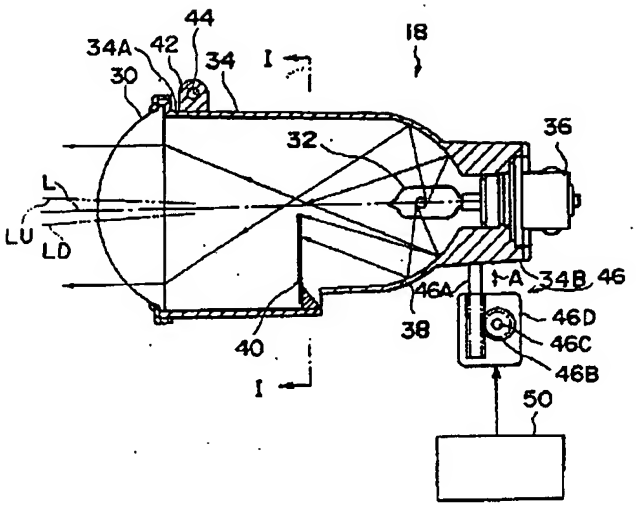
[Drawing 7]



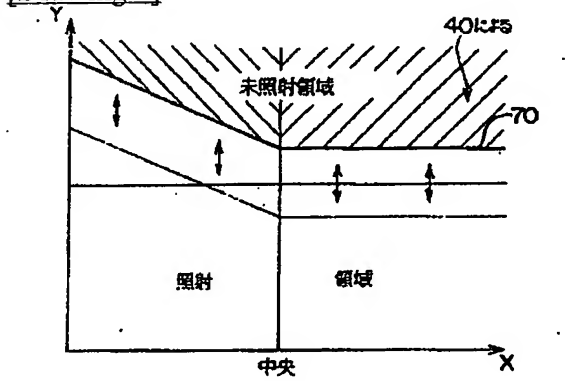
[Drawing 1]



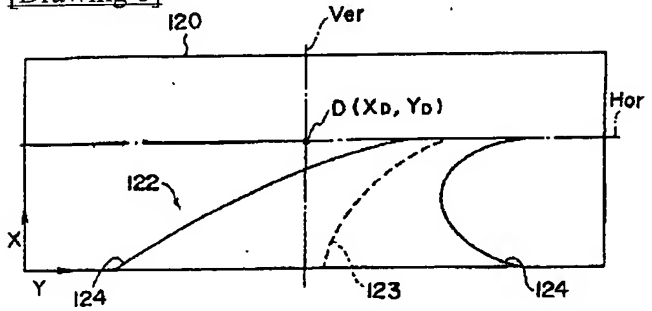
[Drawing 2]



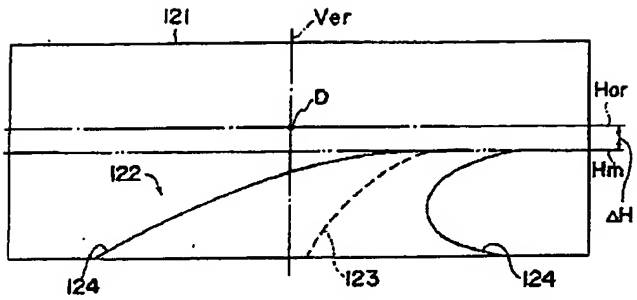
[Drawing 4]



[Drawing 8]



[Drawing 9]



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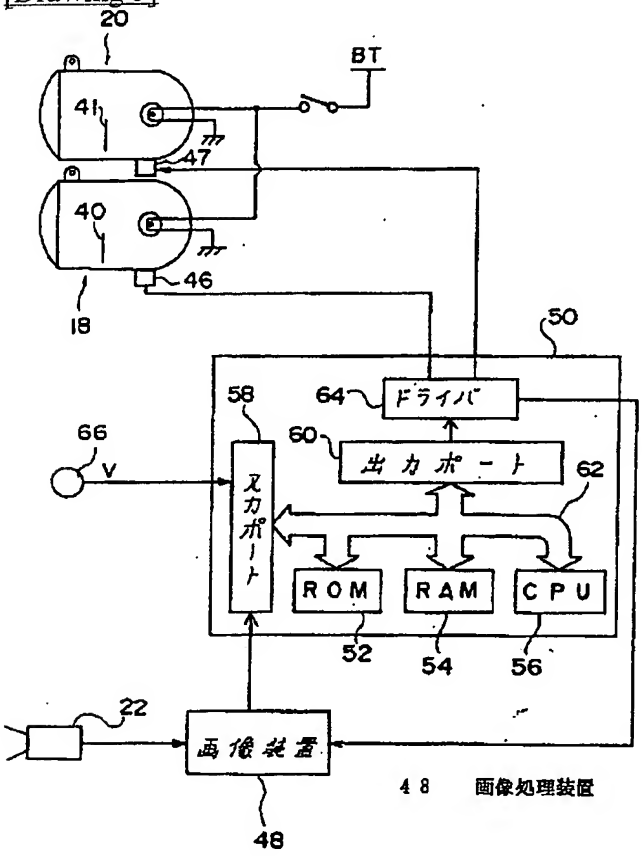
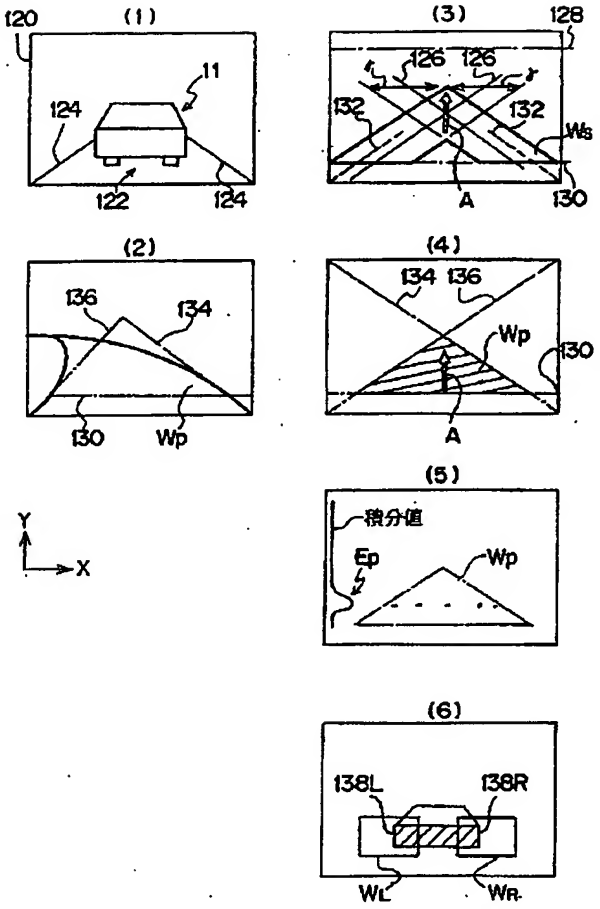
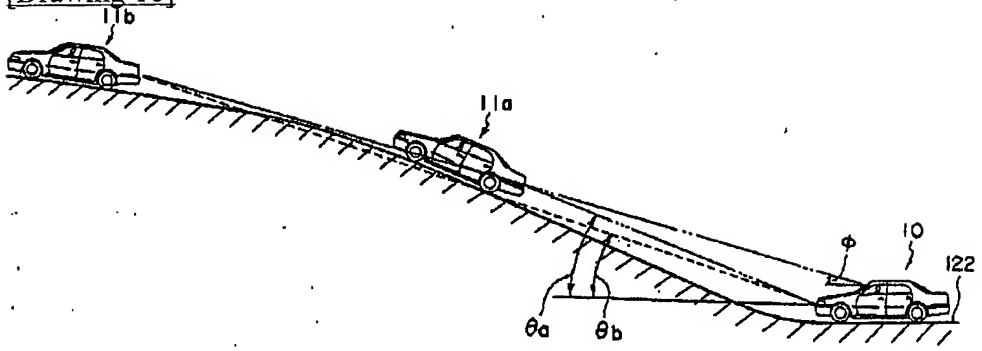


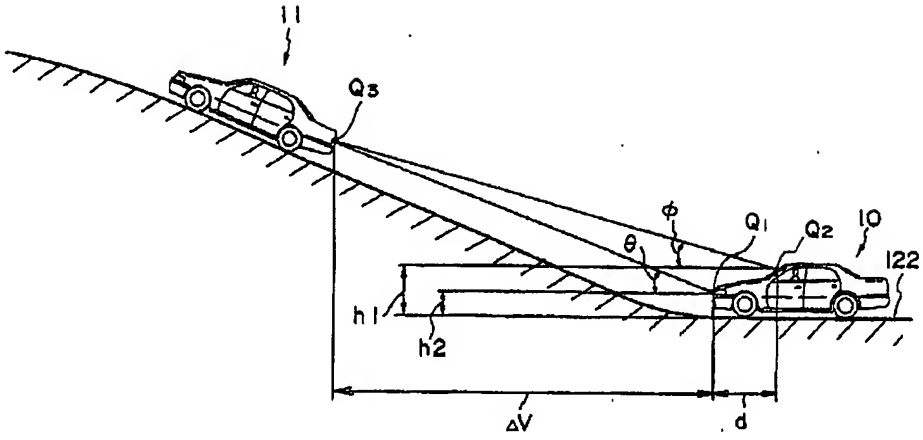
[Drawing 6]



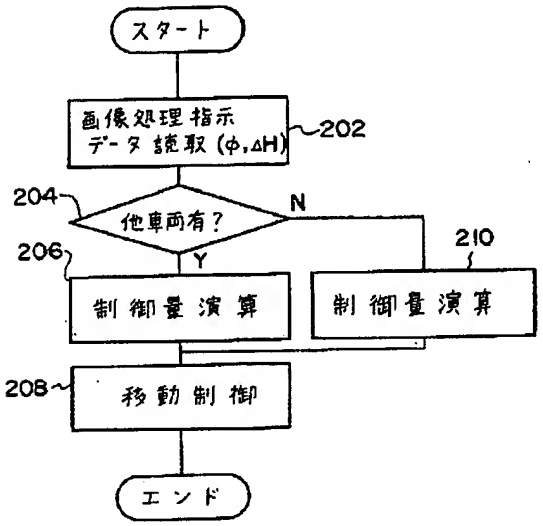
[Drawing 10]



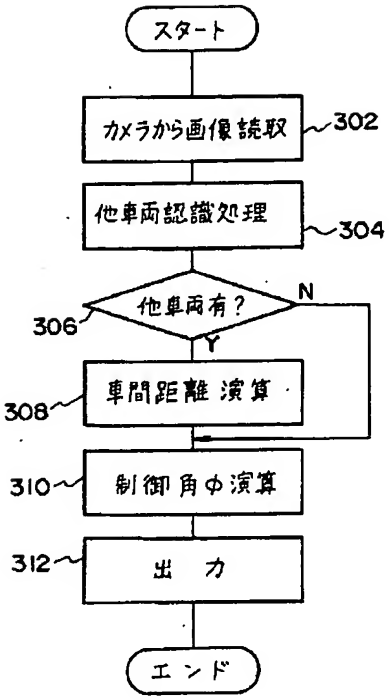
[Drawing 11]



[Drawing 12]



[Drawing 13]



[Translation done.]